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Conveying cup assembly for a fruit handling equipment

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(54) Title  
CONVEYING CUP ASSEMBLY FOR A FRUIT HANDLING EQUIPMENT

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A conveying cup assembly 10 for a fruit handling equipment comprising a carriage 30 adapted to be clipped to a conveying chain 32, a cup 11 adapted to support a single piece of fruit, a cup support 20 secured to the carriage 30 to support the cup whilst carrying the fruit and allowing the cup 11 to tip to facilitate pivotal discharge of the fruit on either side of the conveyor, the cup support 20 being secured to the carriage via a linkage 50 allowing vertical displacement of the cup relative to the carriage.

**Claim**

1. A conveying cup assembly for a fruit handling equipment comprising a carriage adapted to be clipped to a conveying chain, a cup adapted to support a single piece of fruit, a cup support secured to the carriage to support the cup whilst carrying the fruit and allowing the cup to tip to facilitate pivotal discharge of the fruit on either side of the conveyor, the cup support being secured to the carriage via a linkage allowing vertical displacement of the cup relative to the carriage.

ABSTRACT

5 A conveying cup assembly 10 for a fruit handling  
equipment comprising a carriage 30 adapted to be clipped to  
a conveying chain 32, a cup 11 adapted to support a single  
piece of fruit, a cup support 20 secured to the carriage 30  
to support the cup whilst carrying the fruit and allowing  
the cup 11 to tip to facilitate pivotal discharge of the  
10 fruit on either side of the conveyor, the cup support 20  
being secured to the carriage via a linkage 50 allowing  
vertical displacement of the cup relative to the carriage.

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AUSTRALIA  
Patents Act 1990

**COMPLETE SPECIFICATION**  
**STANDARD PATENT**

**Applicant(s):**

Geoffrey William PAYNE

**Invention Title:**

CONVEYING CUP ASSEMBLY FOR A FRUIT HANDLING EQUIPMENT

**Application No:**

**Filing Date:**

The following statement is a full description of this  
invention, including the best method of performing it known to  
me/us:

Title

Conveying Cup Assembly for a Fruit Handling  
Equipment

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Field Of the Invention

This invention relates to a conveying cup  
assembly for a fruit handling equipment and in particular  
relates to equipment that has the capacity to colour sort,  
size and weigh fruit.

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Discussion of Prior Art

On international markets, there are available  
very sophisticated high speed conveying systems that allow  
fruit of various shapes and sizes to be viewed, sorted and  
weighed. The systems usually incorporate means to  
discharge the fruit into categorised bins that relate to  
size, colour and weight. The systems usually comprise a  
series of cups mounted on carriages that are clipped to a  
single or sometimes dual chain driven conveyor. The  
carriage usually supports rollers which cause the fruit to  
be rotated as it passes through a photographic zone in  
which a camera takes pictures of the fruit for analysis by  
a computer. The conveyor also usually incorporates a  
weighing zone at which the cup passes over a load cell so  
that the computer can note the weight of the loaded cup.  
The cup carrying the fruit has usually a capacity to tilt  
sideways at discharge zones so that the computer can  
orchestrate discharge of the fruit into bins classified  
with regard to colour, size or weight.

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Examples of published patent applications that  
disclose equipment of this kind include:

USP 5,244,100,

USP 4,586,613,

USP 4,660,665

PCT/AU95/00523,

PCT/AU92/00551,

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PCT/AU90/00464,  
PCT/NZ93/00126, and  
AUB 655492

The need to rotate the fruit, support the fruit  
5 for high speed travel, effect discharge reliably and  
efficiently and weigh the fruit accurately places a series  
of difficult hurdles for the designers of this equipment to  
overcome. As the demands for these systems increase, there  
is a growing need for elegantly simple, cheap to  
10 manufacture componentary that does the job required in an  
efficient manner.

It is these considerations that have brought  
about the present invention.

Summary of the Invention

15 According to the present invention there is a  
conveying cup assembly for a fruit handling equipment  
comprising a carriage adapted to be clipped to a conveying  
chain, a cup adapted to support a single piece of fruit, a  
cup support secured to the carriage to support the cup  
20 whilst carrying the fruit and allowing the cup to tip to  
facilitate pivotal discharge of the fruit on either side of  
the conveyor, the cup support being secured to the carriage  
via a linkage allowing vertical displacement of the cup  
relative to the carriage, the carriage including means  
25 vertically displaceable relative to the cup to engage the  
fruit and effect rotation of the fruit.

The conveying cup assembly for fruit handling  
equipment in accordance with the present invention provides  
a facility for conveying fruit at high speed, rotating the  
30 fruit in a photographic zone, weighing the fruit at a  
weighing zone and effecting discharge from either side of  
the conveyor. The conveying cup assembly is designed so  
that at the weighing zone, the weight of the fruit is not  
distorted by a component of the forces associated with  
35 horizontal movement of the fruit on the conveyor.

Description of the Drawings

An embodiment of the present invention will now



be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a side on view of part of a conveyor assembly for conveying fruit through a photographic zone, weighing zone and discharge zone,

Figure 2 is a plan view of the conveyor of Figure 1,

Figure 3, is a sectional view taken along the lines 3-3 of Figure 2 illustrating a linkage that interconnects a carriage with a cup support,

Figure 4 is a sectional view taken along the lines 4-4 of Figure 3 showing the fruit cup in a position at which the fruit are conveyed,

Figure 5 is a side on view of a cup assembly at a weighing station,

Figure 6 is a cross sectional view taken along the lines 6-6 of Figure 5,

Figure 7 is a cross sectional view showing the cup assembly at a discharge zone,

Figure 8 is a plan view of a cup assembly showing the linkage of Figure 3, and

Figure 9 is a side on view of the assembly at the photographic zone.

#### Description of the Preferred Embodiments

The fruit handling conveyor assembly illustrated in Figures 1 and 2 of the accompanying drawings comprises an elongate aluminium frame 38 that supports at least one length of conveying chain 32 above the ground surface. The chain 32 is driven in an endless loop by suitably positioned sprockets (not shown). The chain 32 supports a series of conveying cup assemblies 10 positioned end to end along the chain. The conveyor assembly includes along its operative length a loading zone, a photographic zone B, a weighing zone and a discharge zone D. This invention is concerned with the design of each conveying cup assembly 10.

Each conveying cup assembly 10 as illustrated in the accompanying drawings comprises a cup 11 adapted to support a single piece of fruit, the cup being supported by a cup support 20 which is pivotally secured to a carriage 30. The carriage 30 has a downwardly extending chain clip 31 which is connected to the conveying chain 32 so that conveying cup assemblies 10 are positioned end to end along the length of a conveyor to be transported by the chain 32.

The carriage 30 comprises a rectangular base 35 from the underside of which, depend the downwardly projecting central chain clip 31. The underside of the base 35 of the carriage is arranged to be a sliding fit on an aluminium rail 37 that forms the frame 38 of the conveyor assembly. As shown in Figures 4 to 7, the carriage 30 has a pair of parallel upstanding spaced apart side flanges 40, 41. These flanges 40, 41 have opposed centrally positioned vertical slots 42 which support an axle 43 that runs transversely of the longitudinal direction of the conveyor. The axle 43 supports annular drive members in the form of discs 44, 45, 47, 48 with tapering outer peripheries 46. The larger discs 44, 45 are mounted on the outside of the flanges whilst two smaller discs 47, 48 are mounted on the inside of the flanges. The cup 11 which is pivotally secured to the carriage through the cup support 20 is positioned with its lateral centre line offset to the axis of the discs 44, 45, 47, 48. Thus, one side of the peripheries of the discs terminate slightly to the side of the centre line of the cup 11. The location of the adjacent conveying cup assembly ensures that the discs of that assembly are positioned under the other side of the centre line of the cup 11 so that each cup has discs underneath each side of the centre line.

The cup 11 comprises a concave surface 12 defined by a transversely extending central member 13 with five spaced fingers 14 projecting laterally from each side, the fingers 14 defining gaps 15 therebetween through which the outer surfaces of the discs 44, 45, 47 and 48 can extend

when the conveyor enters the photographic zone B. In this zone shown in Figures 1 and 9, the underside of the outer larger discs 44, 45 engages a friction surface 90 associated with the framework 38 of the conveyor which causes the horizontal movement of the conveyor to impart rotational movement to the discs 44, 45, 47 and 48 on the axles 43. The friction surface 90 is positioned at the top of a ramp 91 on either side of the conveyor at the photographic zone B of Figures 1 and 2. As the lower edges of the discs 44, 45 ride up the ramp the axle 43 moves vertically up the slot 42 in the flanges 40 and 41 to reach the position shown in Figures 1 and 9. The central member 13 of each cup is formed integrally with the top of a cup support 20 in the form of an X-shaped web 21 which is pivotally secured to the carriage 30 via a linkage 50. The concave upper surface 12 of the cup 10 freely supports a single piece of fruit (not shown) and the gaps 15 between the fingers 14 allow the outer surfaces 46 of the discs 44, 45 to engage the fruit to cause rotation of the fruit when the conveyor passes the photographic zone B. As shown in Figures 4, 6 and 7, the cup support 20 which in the form of the X-shaped web 21 has an upper pair of outwardly diverging arms 22, 23 which support the underside of the cup 11. The web 21 also includes downwardly extending legs 24, 25 on either side of a triangular shaped central support 26. The central support 26 has a hole 27 in its base and is adapted to be mounted on a rod 28 so that rotation of the rod 28 causes the web 21 to pivot on either side transversely of the direction of the conveyor. The central portion 26 of the web includes an arcuate slot 29 with a small notch 9 at its apex. The notch 9 is adapted to accommodate another rod 51 that is secured to a bracket 49 that bridges the top of the flanges 40, 41. The rod 51 projects with its axis parallel to the longitudinal direction of the conveyor. With the rod 51 located in the notch 9, the web 20 is held centrally of the vertical plane as shown in Figure 4 and the fruit is supported

substantially horizontally by the cup 11 for transportation.

To effect discharge on either side of the conveyor at the discharge zone D shown in Figures 1 and 7, either downwardly extending leg 24 or 25 rides up a ramp 70 on either side of the conveyor to cause the web to tilt to the left or right which has the effect of causing the fruit to roll off the cup into collection bins not shown. Figure 7 shows the ramp 70 engaging the right leg 25 to cause the web 21 to tilt to the left to effect discharge. The upward force on the leg 25 causes the rod 51 to disengage from the notch 9 allowing the slot 29 to move to the left past the rod 51.

The cup support 20 in the form of the X-shaped web 21 is secured to the carriage 30 by the linkage 50 which comprises a pair of I-shaped beams 52, 53 that are mounted in a parallel vertically spaced apart manner coupled at one end on rods 54, 55 that extend across the support flanges 40, 41 of the carriage 30 to allow the I-shaped beams 52, 53 to pivot relative to the carriage. The other end of the parallel I-shaped beams 52, 53 are coupled via rods 56, 57 to the outer flanges 58, 59 of an H-section web 60. The central portion 61 of the H-section web 60 has a forwardly projecting stub axle 63 on which the rod 28 that locates in the aperture 27 of the I-shaped web 21 is mounted to be pivotably rotatable thereon. At the weighing station shown in Figures 5 and 6, the legs 24, 25 of the web 21 ride up ramps 80 to rest on load cells 81 on either side of the conveyor. The ramps 80 cause the web 21 to lift slightly disengaging the rod 51 from the notch 9 in the slot 29. The lower rod 28 is also slightly lifted.

The linkage 50 that is formed by the I-shaped beams 52, 53 allows the rod 28 that supports the cup support 20 to be lifted vertically relative to the carriage to disassociate any force component that might relate to the horizontal movement of the conveyor from the vertical component that is transmitted through the cup 11 and cup

support 20 by the weight of the fruit. In this manner, the load cells can accurately weigh the content of the cup and there is no likelihood of the signal being distorted by force components transmitted through the carriage and  
5 resulting from a horizontal movement of the conveyor.

At the weighing station the whole of the cup and support is lifted vertically. In contrast at the discharge station which may be on either side of the conveyor, one of the legs 24, 25 ride up a ramp 70 which has the effect of  
10 forcing the rod 51 out of engagement with the notch 9 in the slot 29 and causing the web to tilt away from the ramp 70 to effect discharge. Tilting of the web may be caused by a suitably positioned ramp or alternatively by a solenoid (not shown) that is activated by the computer to  
15 engage either leg 24, 25 at a desired position to effect discharge.

Although the conveying cup assembly described above only has one set of rollers at one end, it is understood that when a plurality of these assemblies are  
20 clipped to a chain in a longitudinal line the roller assembly of the next adjacent assembly will locate through the slots and the fingers of the cup to engage the opposite side of the fruit so that as shown in the drawings the fruit is engaged by rollers at each end of the cup to  
25 ensure rotation of the fruit through the photographic zone.

The components of the conveying cup assembly except the rods and pins are designed to be moulded in plastics. The assembly is light, durable yet effective to facilitate rotation of fruit in the photographic zone,  
30 accurate weighing of the fruit in the weighing zone, and positive discharge to either side of the conveyor at selected discharge zones.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A conveying cup assembly for a fruit handling equipment comprising a carriage adapted to be clipped to a conveying chain, a cup adapted to support a single piece of fruit, a cup support secured to the carriage to support the cup whilst carrying the fruit and allowing the cup to tip to facilitate pivotal discharge of the fruit on either side of the conveyor, the cup support being secured to the carriage via a linkage allowing vertical displacement of the cup relative to the carriage, the carriage including means vertically displaceable relative to the cup to engage the fruit and effect rotation of the fruit.
2. The assembly according to Claim 1 wherein the cup has a base that is adapted to support a single piece of fruit, gaps being provided in the cup base through which the means to effect rotation of the fruit can extend to engage the fruit.
3. The assembly according to Claim 2 wherein a series of discs extend through slots in the base of the cup, the discs being arranged to engage an inclined ramp to impart rotation as the assembly moves past the ramp.
4. The assembly according to Claim 3 wherein the discs are mounted axially offset to the cup to extend through slots in the base of the cup on one side of the cup, the adjacent cup assembly having discs that extend through the slots on the other side of the cup.
5. The assembly according to any one of the preceding claims wherein the cup has a downwardly extending web that has its base pivotally secured to the linkage, the web having an arcuate slot with a central notch that cooperates with a lug projecting from the carriage whereby when the lug is in the notch, the web is vertical so that



the cup supports a piece of fruit and when a lateral force is placed on either side of the web, the web pivots causing the lug to move to either end of the arcuate slot causing the cup to tip and discharge the fruit.

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6. The assembly according to Claim 5 wherein the web has a downwardly projecting foot on each side that is adapted to be displaced to cause the lug to be dislodged from the notch.

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7. The assembly according to either Claim 5 or 6 wherein the base of the web is secured to a pivot, the pivot in turn being secured to the linkage and the linkage facilitating vertical displacement of the pivot.

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8. A conveying cup assembly for fruit handling equipment substantially as described herein with reference to and as illustrated in the accompanying drawings.

20 Dated this 4th day of December 1998

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By their Patent Attorneys

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25 Attorneys of Australia



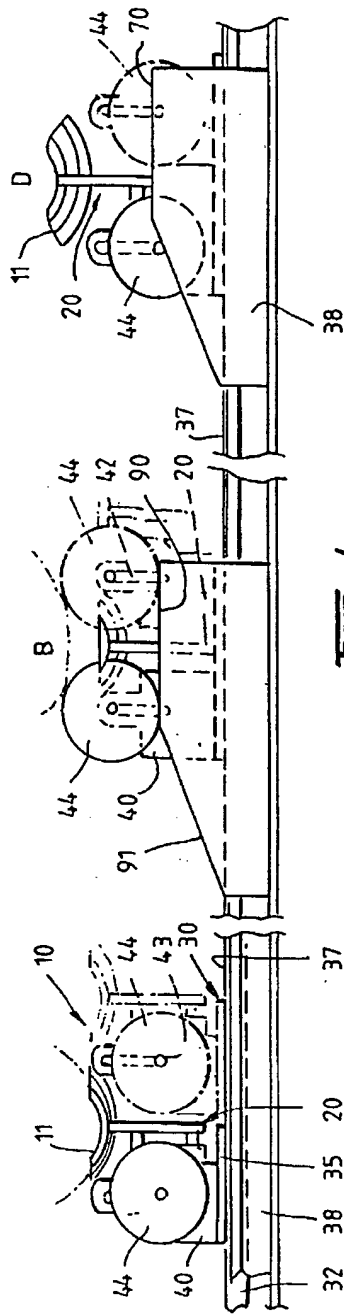


Fig. 1.

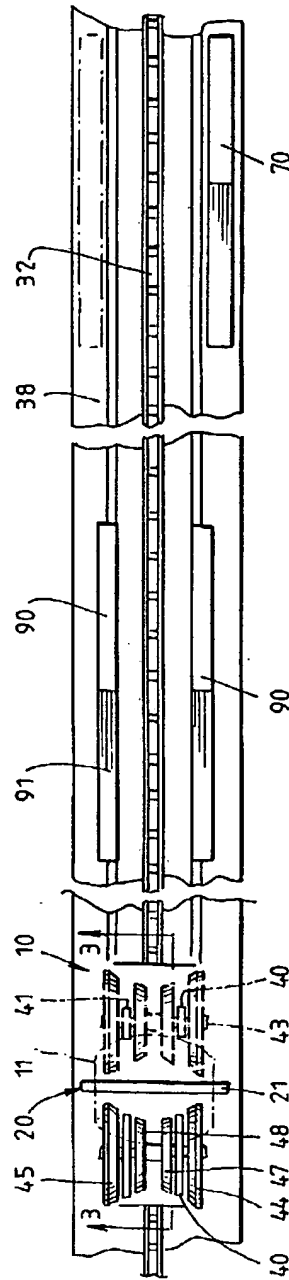


Fig. 2.

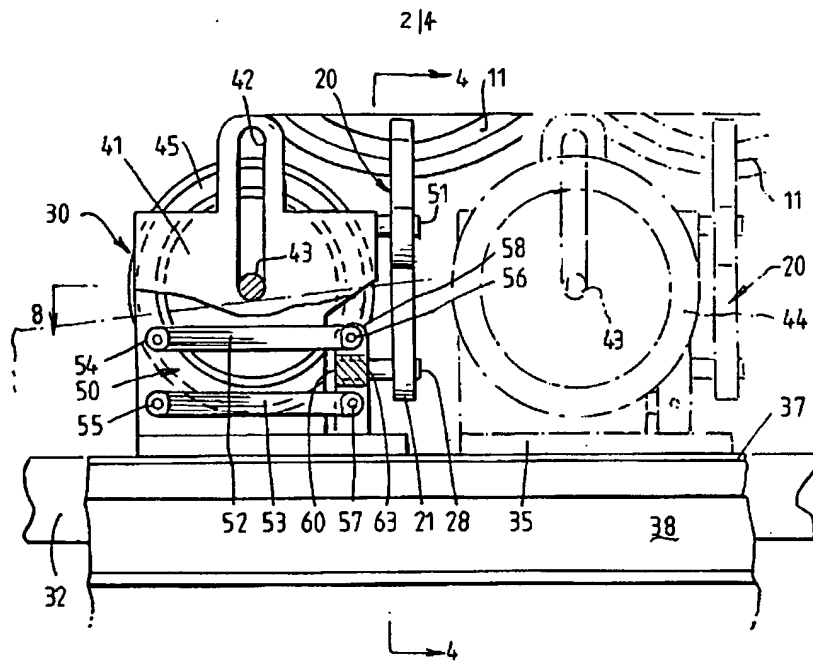


Fig. 3.

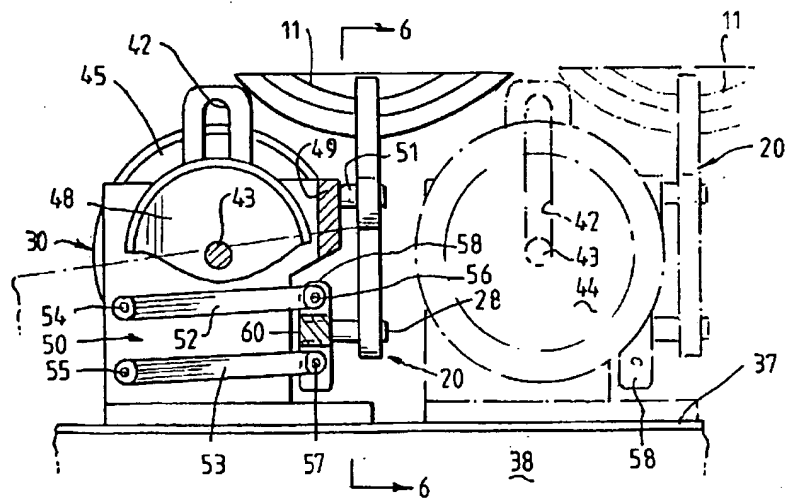


Fig. 5.

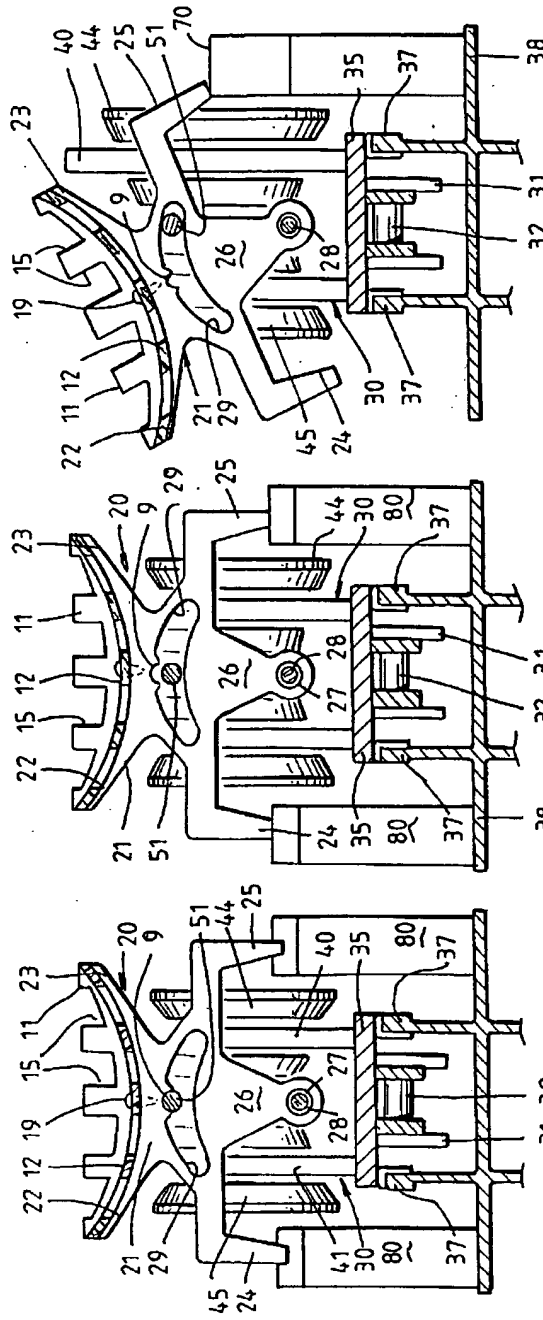


Fig. 4.

Fig. 6.

Fig. 7.

